WE CLAIM:

1. A laser light pulse stretching unit comprising:

a beam splitter in the path of a laser output light pulse beam;

the beam splitter selected to pass a first percent of the energy of a first input pulse of the laser output light pulse beam along a laser output light pulse beam output path as a first output pulse and to reflect a second percent of the energy of the laser output light pulse beam into a first delayed beam;

an optical delay path receiving the first delayed beam and returning the first delayed beam to the beam splitter in an orientation such that a third percent of the first delayed beam is reflected into the output path as a second output pulse and a fourth percent is passed into the optical delay path as a second delayed beam;

the optical delay path receiving the second delayed beam and returning the second delayed beam to the beam splitter in an orientation such that the third percent of the second delayed beam is reflected into the output path as a third output pulse and the fourth percent of the second delayed beam is passed into the optical delay path as a third delayed beam;

the optical delay path receiving the third delayed beam and returning the third delayed beam to the beam splitter in an orientation such that the third percent of the third delayed beam is reflected into the output path as a fourth output pulse;

the first input pulse being a first pulse in a plurality of pulses output from a prior pulse stretcher, each of a plurality of succeeding input pulses comprising the output of the prior pulse stretcher resulting from the stretching of a narrow band laser light output pulse, forming successive first, second, third and fourth output pulses, the combination of which forms a pulse stretcher having an output with a TIS of at least 200ns.

2. The apparatus of claim 1 further comprising:

the optical delay path being formed of a plurality of at least eight reflecting mirrors.

3. The apparatus of claim 2 further comprising:

the optical delay path being contained in an elongated enclosure having a first end and a second end;

a first end plate at the first end and a second end plate at the second end;

the first end plate having a first mounting surface within the enclosure and the second end plate having a second mounting surface within the enclosure;

a first group of at least four of the at least eight reflecting mirrors mounted on the first mounting surface symmetrically about a center axis of the optical delay path and a second group of at least four of the at least eight reflecting mirrors mounted on the second mounting surface symmetrically about the center axis.

4. The apparatus of claim 2 further comprising:

the plurality of mirrors form a first group and a second group, each of the first group and second group being staggered in a predefined pattern.

5. The apparatus of claim 3 further comprising:

each of the first group and the second group are staggered in a selected pattern.

6. The apparatus of claim 4 further comprising:

the pattern can be circumscribed by a circle.

7. The apparatus of claim 5 further comprising:

the pattern can be circumscribed by a circle.

8. The apparatus of claim 4 further comprising:

the reflections of the first delayed beam, the second delayed beam and the third delayed beam, between a mirror in one of the first and second groups to a mirror in the other of the first and second groups, as relates to a selected axis of the beam, the beam paths lie in a plurality of planes.

9. The apparatus of claim 5 further comprising:

the reflections of the first delayed beam, the second delayed beam and the third delayed beam, between a mirror in one of the first and second groups to a mirror in the other of the first and second groups, as relates to a selected axis of the beam, the beam paths lie in a plurality of planes.

10. The apparatus of claim 6 further comprising:

the reflections of the first delayed beam, the second delayed beam and the third delayed beam, between a mirror in one of the first and second groups to a mirror in the other of the first and second groups, as relates to a selected axis of the beam, the beam paths lie in a plurality of planes.

11. The apparatus of claim 7 further comprising:

the reflections of the first delayed beam, the second delayed beam and the third delayed beam, between a mirror in one of the first and second groups to a mirror in the other of the first and second groups, as relates to a selected axis of the beam, the beam paths lie in a plurality of planes.

12. A pulse stretcher for increasing the TIS of a narrow band output pulse of a laser output light pulse beam comprising:

a beam splitter in the path of the laser output light pulse beam, splitting the laser output light pulse beam into an output beam and a delayed beam;

an optical delay path receiving the delayed beam, the optical delay path comprising:

a first group of at least four mirrors, at least two of which are displaced out of the plane of the delayed beam as it is reflected from the beam splitter;

a second group of at least four mirrors, at least two of which are displaced out of the plane of the delayed beam as it is reflected from the beam splitter;

a first mounting plate containing the first group of mirrors arranged in a symmetrical pattern about a centerline axis of the first mounting plate; and,

a second mounting plate containing the first group of mirrors arranged in a symmetrical pattern about a centerline axis of the second mounting plate.

13. The apparatus of claim 12 further comprising:

the pulse stretcher is contained within an elongated housing.

14. The apparatus of claim 13 further comprising:

the elongated housing is cylindrical.

15. The apparatus of claim 12 further comprising:

the paths of the delayed beam within the optical delay path of the pulse stretcher are all out of the plane of the delayed bean as it is reflected by the beam splitter into the optical delay path with the exception of the delayed beam as it is reflected back to the beam splitter.

16. The apparatus of claim 13 further comprising:

the paths of the delayed beam within the optical delay path of the pulse stretcher are all out of the plane of the delayed bean as it is reflected by the beam splitter into the optical delay path with the exception of the delayed beam as it is reflected back to the beam splitter.

17. The apparatus of claim 14 further comprising:

the paths of the delayed beam within the optical delay path of the pulse stretcher are all out of the plane of the delayed bean as it is reflected by the beam splitter into the optical delay path with the exception of the delayed beam as it is reflected back to the beam splitter.

18. A laser producing a narrow band laser output light pulse beam for use in micro-lithography illumination, comprising:

a laser light pulse stretching unit comprising:

a beam splitter in the path of a laser output light pulse beam;

the beam splitter selected to pass a first percent of the energy of a first input pulse of the laser output light pulse beam along a laser output light pulse beam output path as a

first output pulse and to reflect a second percent of the energy of the laser output light pulse beam into a first delayed beam;

an optical delay path receiving the first delayed beam and returning the first delayed beam to the beam splitter in an orientation such that a third percent of the first delayed beam is reflected into the output path as a second output pulse and a fourth percent is passed into the optical delay path as a second delayed beam;

the optical delay path receiving the second delayed beam and returning the second delayed beam to the beam splitter in an orientation such that the third percent of the second delayed beam is reflected into the output path as a third output pulse and the fourth percent of the second delayed beam is passed into the optical delay path as a third delayed beam;

the optical delay path receiving the third delayed beam and returning the third delayed beam to the beam splitter in an orientation such that the third percent of the third delayed beam is reflected into the output path as a fourth output pulse;

the first input pulse being a first pulse in a plurality of pulses output from a prior pulse stretcher, each of a plurality of succeeding input pulses comprising the output of the prior pulse stretcher resulting from the stretching of a narrow band laser light output pulse, forming successive first, second, third and fourth output pulses, the combination of which forms a pulse stretcher having an output with a TIS of at least 200ns.

19. The apparatus of claim 18 further comprising:

the optical delay path being formed of a plurality of at least eight reflecting mirrors.

20. The apparatus of claim 19 further comprising:

the optical delay path being contained in an elongated enclosure having a first end and a second end;

a first end plate at the first end and a second end plate at the second end;

the first end plate having a first mounting surface within the enclosure and the second end plate having a second mounting surface within the enclosure;

a first group of at least four of the at least eight reflecting mirrors mounted on the first mounting surface symmetrically about a center axis of the optical delay path and a second group of at least four of the at least eight reflecting mirrors mounted on the second mounting surface symmetrically about the center axis.

21. The apparatus of claim 19 further comprising:

the plurality of mirrors form a first group and a second group, each of the first group and second group being staggered in a predefined pattern.

22. The apparatus of claim 20 further comprising:

each of the first group and the second group are staggered in a selected pattern.

23. The apparatus of claim 21 further comprising:

the pattern can be circumscribed by a circle.

24. The apparatus of claim 22 further comprising:

the pattern can be circumscribed by a circle.

25. The apparatus of claim21 further comprising:

the reflections of the first delayed beam, the second delayed beam and the third delayed beam, between a mirror in one of the first and second groups to a mirror in the other of the first and second groups, as relates to a selected axis of the beam, the beam paths lie in a plurality of planes.

26. The apparatus of claim22 further comprising:

the reflections of the first delayed beam, the second delayed beam and the third delayed beam, between a mirror in one of the first and second groups to a mirror in the other of the first and second groups, as relates to a selected axis of the beam, the beam paths lie in a plurality of planes.

27. The apparatus of claim 23 further comprising:

the reflections of the first delayed beam, the second delayed beam and the third delayed beam, between a mirror in one of the first and second groups to a mirror in the other of the first and second groups, as relates to a selected axis of the beam, the beam paths lie in a plurality of planes.

28. The apparatus of claim 24 further comprising:

the reflections of the first delayed beam, the second delayed beam and the third delayed beam, between a mirror in one of the first and second groups to a mirror in the other of the first and second groups, as relates to a selected axis of the beam, the beam paths lie in a plurality of planes.

29. A pulse stretcher for increasing the TIS of a narrow band output pulse of a laser output light pulse beam comprising:

a beam splitter in the path of the laser output light pulse beam, splitting the laser output light pulse beam into an output beam and a delayed beam;

an optical delay path receiving the delayed beam, the optical delay path comprising:

a first group of at least four mirrors, at least two of which are displaced out of the plane of the delayed beam as it is reflected from the beam splitter;

a second group of at least four mirrors, at least two of which are displaced out of the plane of the delayed beam as it is reflected from the beam splitter;

a first mounting plate containing the first group of mirrors arranged in a symmetrical pattern about a centerline axis of the first mounting plate; and,

a second mounting plate containing the first group of mirrors arranged in a symmetrical pattern about a centerline axis of the second mounting plate.

30. The apparatus of claim 29 further comprising:

the pulse stretcher is contained within an elongated housing.

31. The apparatus of claim 30 further comprising:

the elongated housing is cylindrical.

32. The apparatus of claim 29 further comprising:

the paths of the delayed beam within the optical delay path of the pulse stretcher are all out of the plane of the delayed bean as it is reflected by the beam splitter into the optical delay path with the exception of the delayed beam as it is reflected back to the beam splitter.

33. The apparatus of claim 30 further comprising:

the paths of the delayed beam within the optical delay path of the pulse stretcher are all out of the plane of the delayed bean as it is reflected by the beam splitter into the optical delay path with the exception of the delayed beam as it is reflected back to the beam splitter.

34. The apparatus of claim 31 further comprising:

the paths of the delayed beam within the optical delay path of the pulse stretcher are all out of the plane of the delayed bean as it is reflected by the beam splitter into the optical delay path with the exception of the delayed beam as it is reflected back to the beam splitter.

35. A beam delivery unit for delivering a laser output light pulse beam from a narrow band laser system output to the input of a micro-lithography tool, comprising:

a laser light pulse stretching unit comprising:

a beam splitter in the path of a laser output light pulse beam;

the beam splitter selected to pass a first percent of the energy of a first input pulse of the laser output light pulse beam along a laser output light pulse beam output path as a first output pulse and to reflect a second percent of the energy of the laser output light pulse beam into a first delayed beam;

an optical delay path receiving the first delayed beam and returning the first delayed beam to the beam splitter in an orientation such that a third percent of the first delayed beam is reflected into the output path as a second output pulse and a fourth percent is passed into the optical delay path as a second delayed beam;

the optical delay path receiving the second delayed beam and returning the second delayed beam to the beam splitter in an orientation such that the third percent of the second delayed beam is reflected into the output path as a third output pulse and the fourth percent of the second delayed beam is passed into the optical delay path as a third delayed beam;

the optical delay path receiving the third delayed beam and returning the third delayed beam to the beam splitter in an orientation such that the third percent of the third delayed beam is reflected into the output path as a fourth output pulse;

the first input pulse being a first pulse in a plurality of pulses output from a prior pulse stretcher, each of a plurality of succeeding input pulses comprising the output of the prior pulse stretcher resulting from the stretching of a narrow band laser light output pulse, forming successive first, second, third and fourth output pulses, the combination of which forms a pulse stretcher having an output with a TIS of at least 200ns.

36. The apparatus of claim 35 further comprising:

the optical delay path being formed of a plurality of at least eight reflecting mirrors.

37. The apparatus of claim 36 further comprising:

the optical delay path being contained in an elongated enclosure having a first end and a second end;

a first end plate at the first end and a second end plate at the second end;

the first end plate having a first mounting surface within the enclosure and the second end plate having a second mounting surface within the enclosure;

a first group of at least four of the at least eight reflecting mirrors mounted on the first mounting surface symmetrically about a center axis of the optical delay path and a second group of at least four of the at least eight reflecting mirrors mounted on the second mounting surface symmetrically about the center axis.

38. The apparatus of claim 36 further comprising:

the plurality of mirrors form a first group and a second group, each of the first group and second group being staggered in a predefined pattern.

39. The apparatus of claim 37 further comprising:

each of the first group and the second group are staggered in a selected pattern.

40. The apparatus of claim 38 further comprising:

the pattern can be circumscribed by a circle.

41. The apparatus of claim 39 further comprising:

the pattern can be circumscribed by a circle.

42. The apparatus of claim 38 further comprising:

the reflections of the first delayed beam, the second delayed beam and the third delayed beam, between a mirror in one of the first and second groups to a mirror in the other of the first and second groups, as relates to a selected axis of the beam, the beam paths lie in a plurality of planes.

43. The apparatus of claim 39 further comprising:

the reflections of the first delayed beam, the second delayed beam and the third delayed beam, between a mirror in one of the first and second groups to a mirror in the other of the first and second groups, as relates to a selected axis of the beam, the beam paths lie in a plurality of planes.

44. The apparatus of claim 40 further comprising:

the reflections of the first delayed beam, the second delayed beam and the third delayed beam, between a mirror in one of the first and second groups to a mirror in the other of the first and second groups, as relates to a selected axis of the beam, the beam paths lie in a plurality of planes.

45. The apparatus of claim 41 further comprising:

the reflections of the first delayed beam, the second delayed beam and the third delayed beam, between a mirror in one of the first and second groups to a mirror in the other of the first and second groups, as relates to a selected axis of the beam, the beam paths lie in a plurality of planes.

46. A pulse stretcher for increasing the TIS of a narrow band output pulse of a laser output light pulse beam comprising:

a beam splitter in the path of the laser output light pulse beam, splitting the laser output light pulse beam into an output beam and a delayed beam;

an optical delay path receiving the delayed beam, the optical delay path comprising:

a first group of at least four mirrors, at least two of which are displaced out of the plane of the delayed beam as it is reflected from the beam splitter;

a second group of at least four mirrors, at least two of which are displaced out of the plane of the delayed beam as it is reflected from the beam splitter;

a first mounting plate containing the first group of mirrors arranged in a symmetrical pattern about a centerline axis of the first mounting plate; and,

a second mounting plate containing the first group of mirrors arranged in a symmetrical pattern about a centerline axis of the second mounting plate.

47. The apparatus of claim 46 further comprising:

the pulse stretcher is contained within an elongated housing.

48. The apparatus of claim 47 further comprising:

the elongated housing is cylindrical.

49. The apparatus of claim 46 further comprising:

the paths of the delayed beam within the optical delay path of the pulse stretcher are all out of the plane of the delayed bean as it is reflected by the beam splitter into the optical delay path with the exception of the delayed beam as it is reflected back to the beam splitter.

50. The apparatus of claim 47 further comprising:

the paths of the delayed beam within the optical delay path of the pulse stretcher are all out of the plane of the delayed bean as it is reflected by the beam splitter into the optical delay path with the exception of the delayed beam as it is reflected back to the beam splitter.

51. The apparatus of claim 48 further comprising:

the paths of the delayed beam within the optical delay path of the pulse stretcher are all out of the plane of the delayed bean as it is reflected by the beam splitter into the optical delay path with the exception of the delayed beam as it is reflected back to the beam splitter.

52. A method of delivering a laser output light pulse beam from a narrow band laser system output to the input of a micro-lithography tool, comprising:

providing a stretched laser light output pulse beam containing a plurality of pulses;

splitting the beam to pass a first percent of the energy of a first input pulse of the stretched laser output light pulse beam along a laser output light pulse beam output path as a first output pulse and to reflect a second percent of the energy of the first input pulse into a first delayed beam;

providing an optical delay path and delaying the first delayed beam and returning the first delayed beam to the beam splitter in an orientation such that a third percent of the first delayed beam is reflected into the output path as a second output pulse and a fourth percent is passed into the optical delay path as a second delayed beam;

receiving in the optical delay path the second delayed beam and returning the second delayed beam to the beam splitter in an orientation such that the third percent of the second delayed beam is reflected into the output path as a third output pulse and the fourth percent of the second delayed beam is passed into the optical delay path as a third delayed beam;

receiving in the optical delay path the third delayed beam and returning the third delayed beam to the beam splitter in an orientation such that the third percent of the third delayed beam is reflected into the output path as a fourth output pulse;

the first stretched input pulse being a first pulse in a plurality of pulses output from a prior pulse stretcher, each of a plurality of succeeding input pulses comprising the output of the prior pulse stretcher resulting from the stretching of a narrow band laser light output pulse, forming successive first, second, third and fourth output pulses, the combination of which forms a pulse stretcher having an output with a TIS of at least 200ns.